Survey of *Cladophora* and Water Quality

Paul Garrison and Steve Greb
DNR Integrated Science Services
Shaili Pfeiffer
DNR Office of the Great Lakes

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Objectives

- What is the density and distribution of *Cladophora* along Wisconsin's Lake Michigan coastline?
- What are nearshore nutrient concentration?

DNR *Cladophora* Working Group

Mary Gansberg, NER

John Masterson, SER

Jim Baumann, OGL

Linda Talbot, OGL

Gina LaLiberte, ISS

Collaborators

Northeast Region

Southeast Region

Integrated Science Services

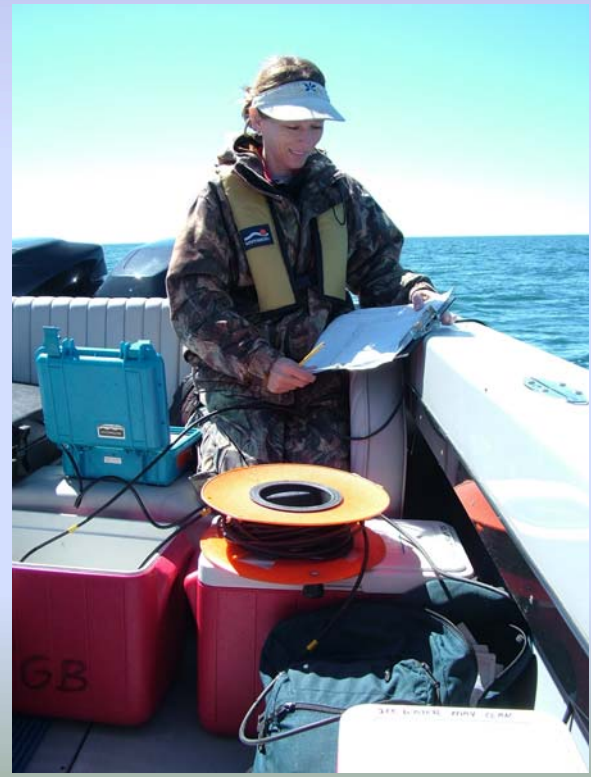
Centerville Cares

Beach Monitoring Program

Funding support by:

WISCONSIN DEPT. OF NATURAL RESOURCES

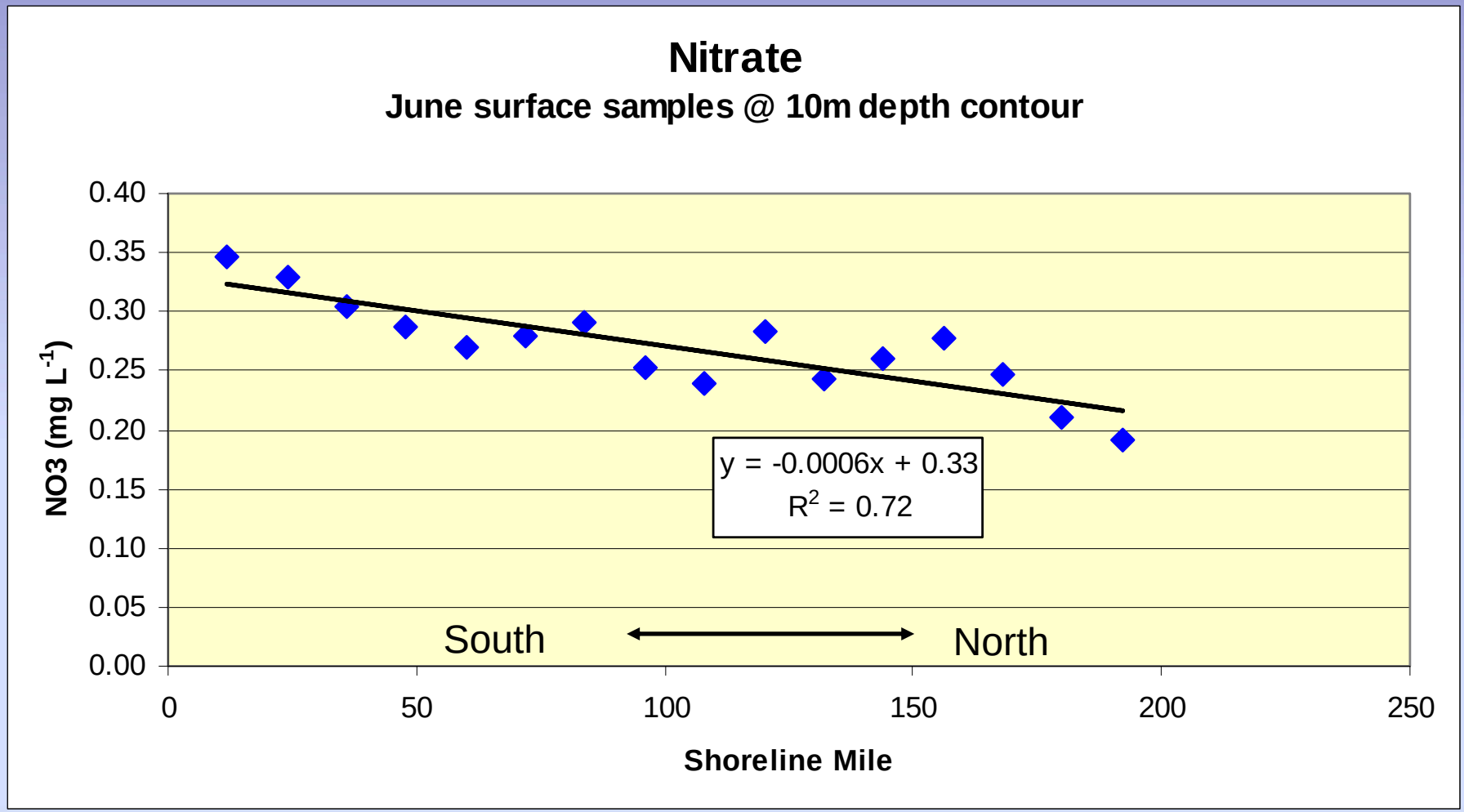
WISCONSIN COASTAL MANAGEMENT PROGRAM



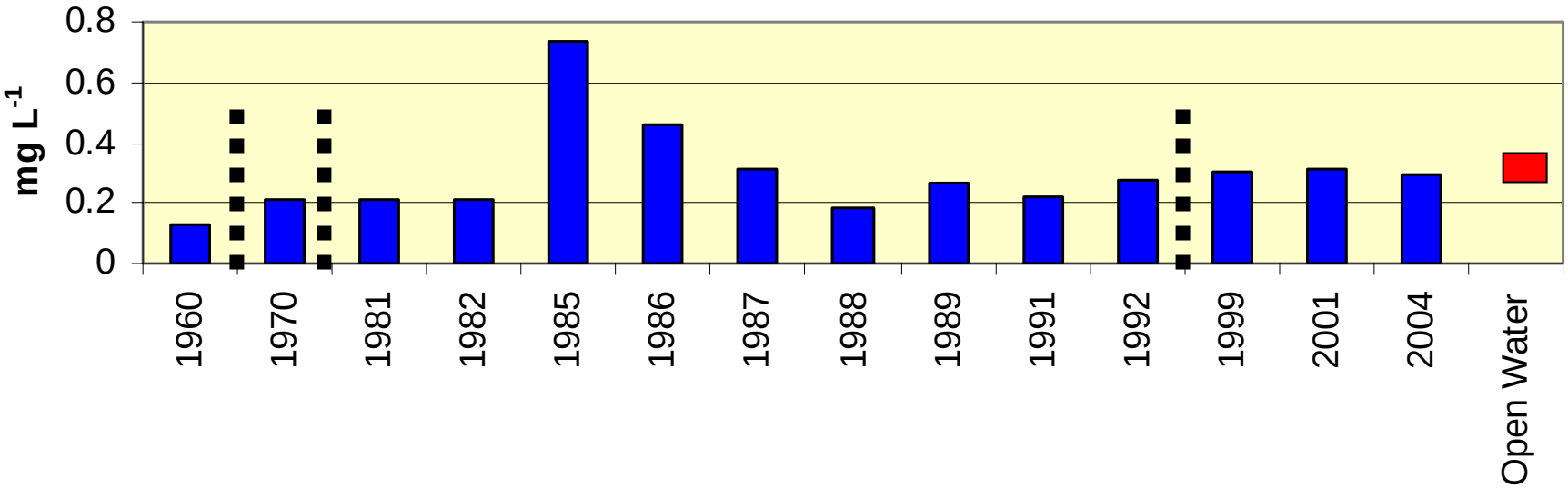
Paired Signed Rank Test

Comparison*	Suspended Solids	Chl-a	Organic-N	Nitrate-N	Total Phosphorus	Dissolved Phosphorus
2 m surface vs. 10 m surface		0.076				0.11
10 m surface vs. 10 m bottom	0.62	0.25	0.17		0.86	0.56
June Sampling vs. Sept. Sampling	**	0.077				

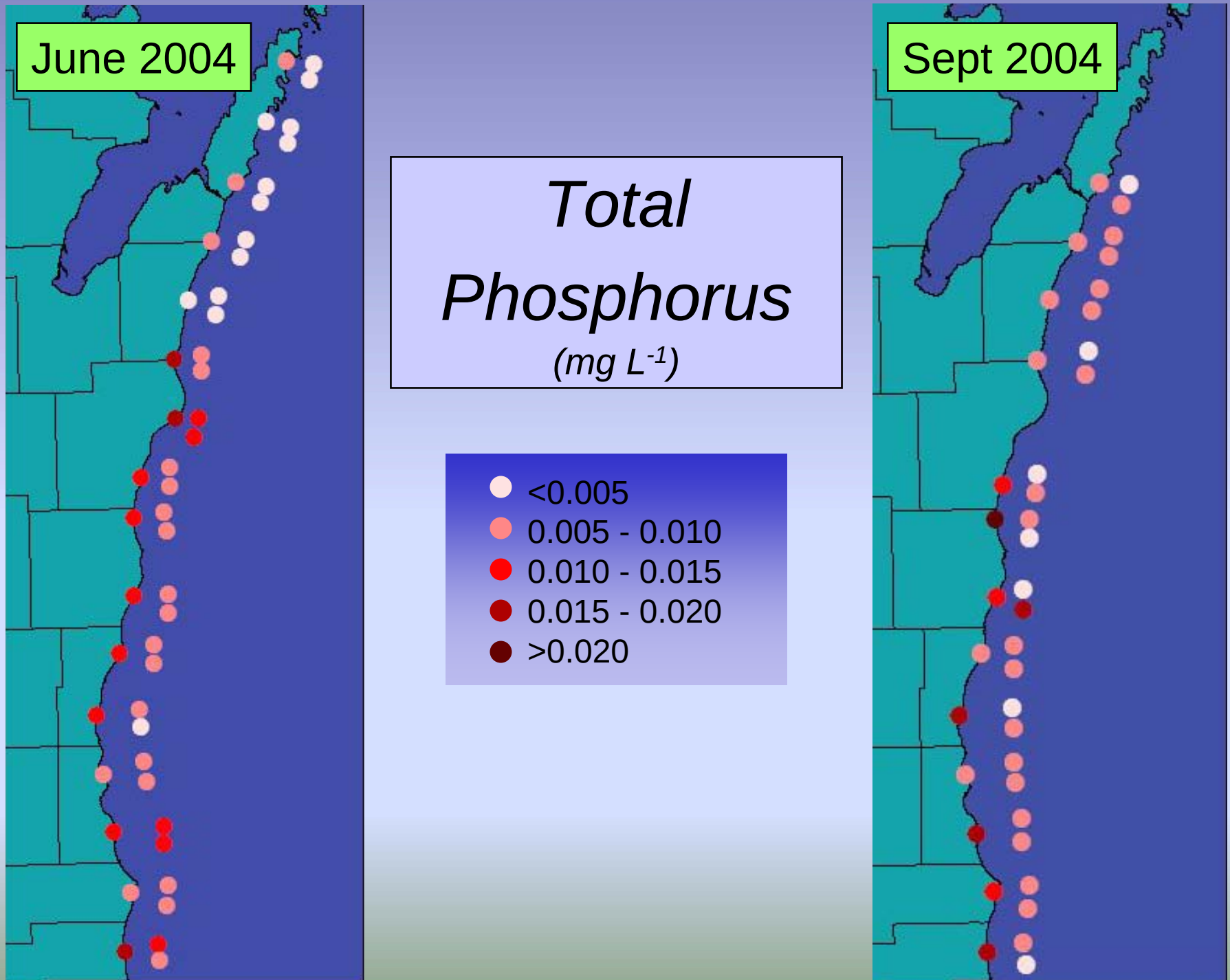
* Color corresponds to grouping with statistically greater value.

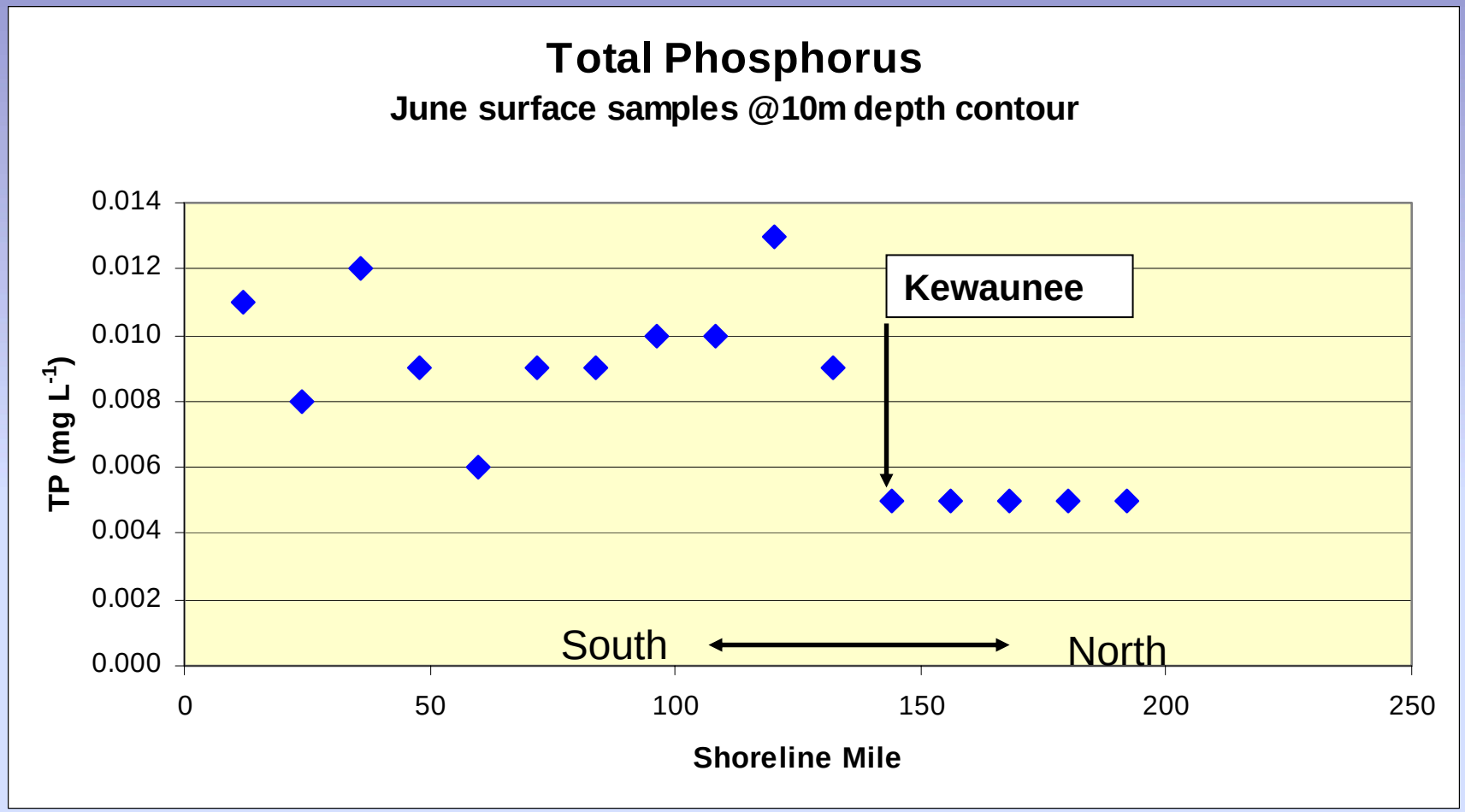

Nitrate
June surface samples @ 10m depth contour
NO3 (mg L-1)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
y = -0.0006x + 0.33
R2 = 0.72
South
North
0
50
100
150
200
250
Shoreline Mile

Nitrate Historical Values
for Ozaukee, Milwaukee, Racine and Kenosha Counties*

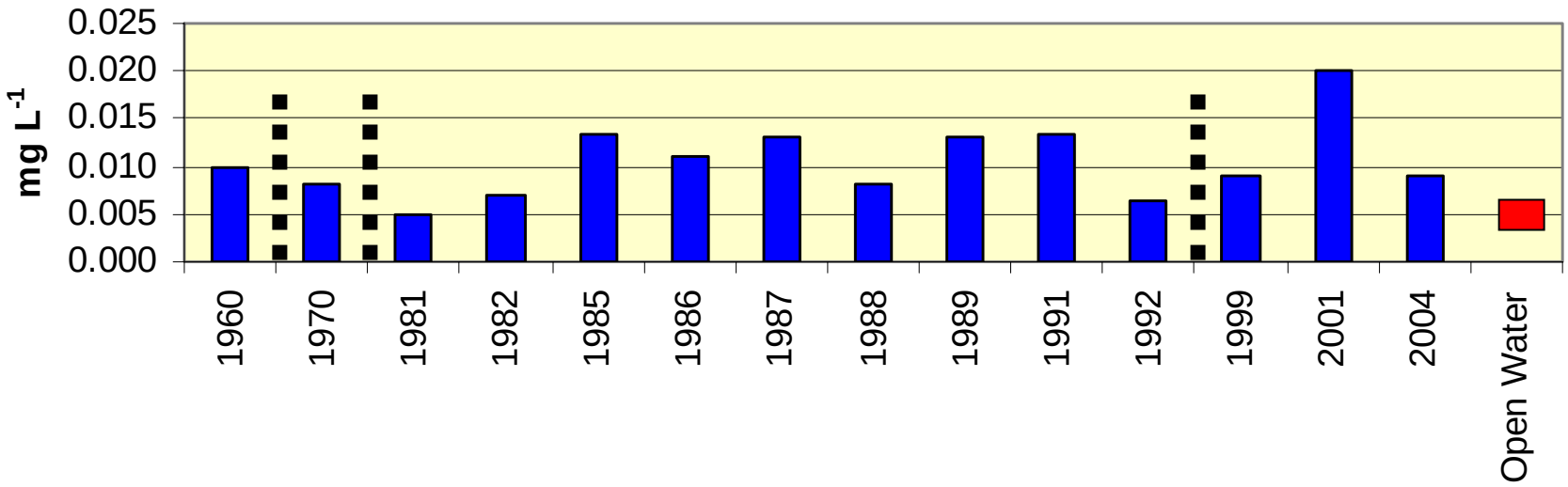


* Year axis not to scale. Open water data from GLNPO's annual spring program, 1983-2002.


June 2004
Sept 2004
Total Phosphorus
(mg L-1)
<0.005
0.005 - 0.010
0.010 - 0.015
0.015 - 0.020
>0.020


Total Phosphorus
June surface samples @10m depth contour
TP (mg L-1)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
0
50
100
150
200
250
Shoreline Mile
Kewaunee
South
North

Total Phosphorus Historical Values
for Ozaukee, Milwaukee, Racine and Kenosha Counties*



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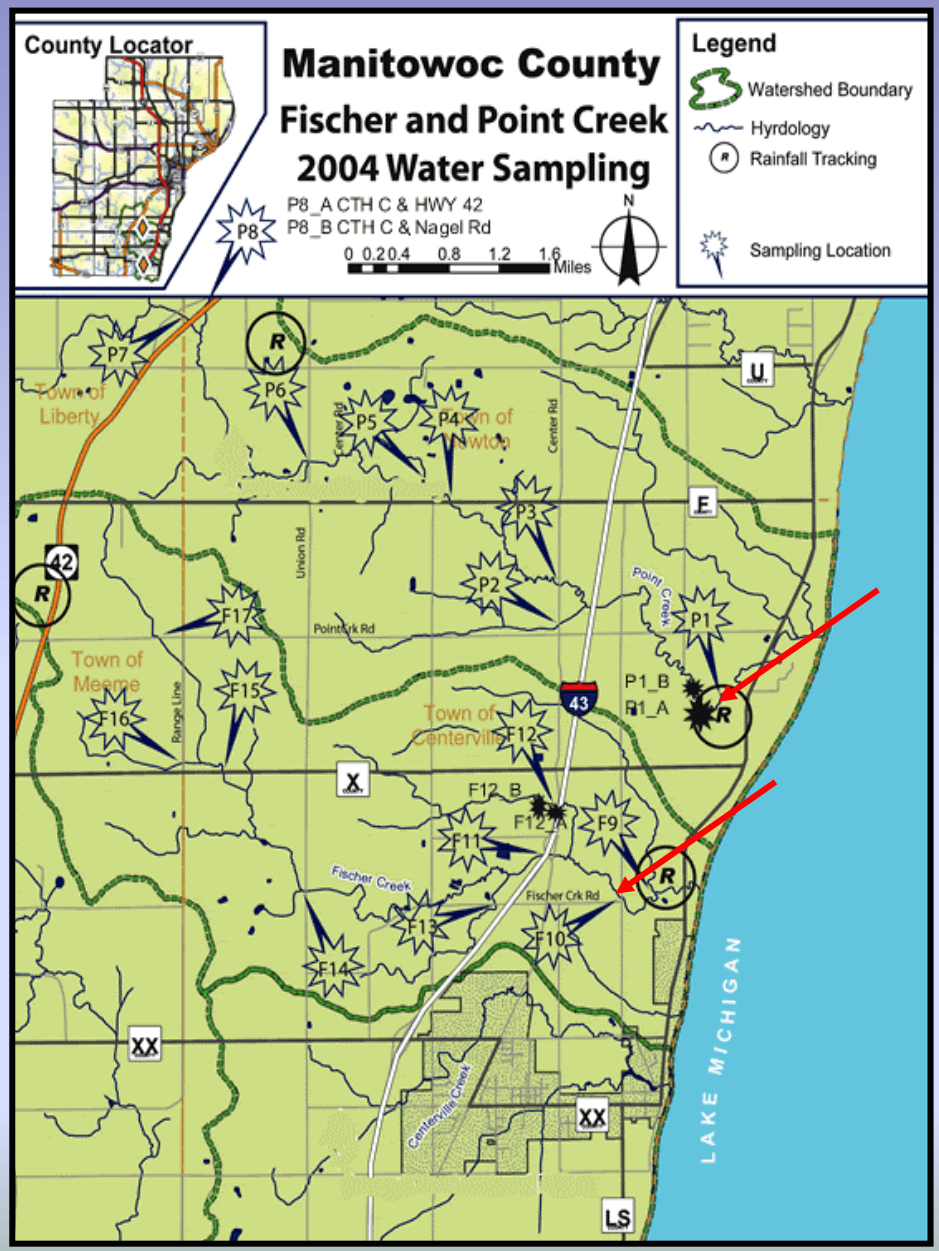
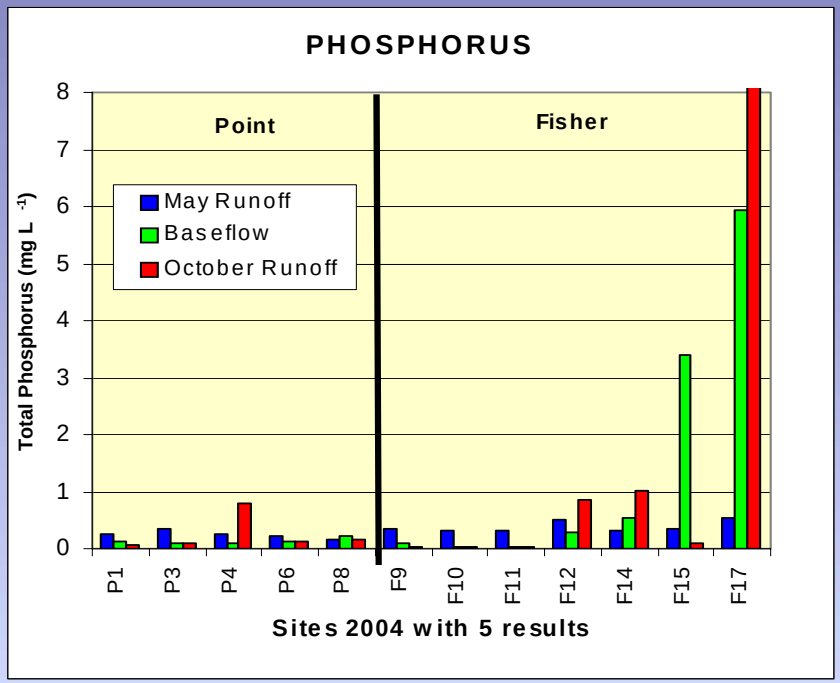
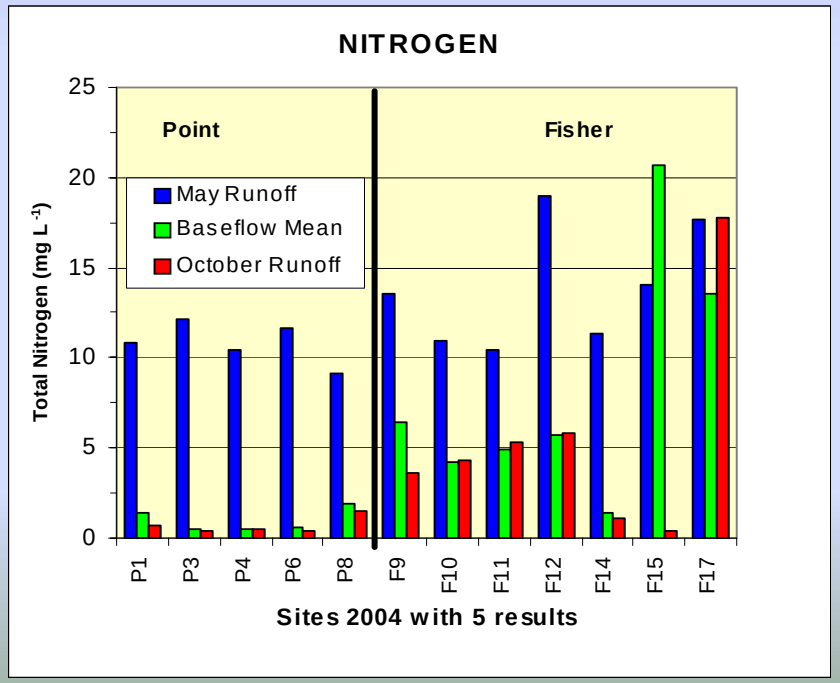
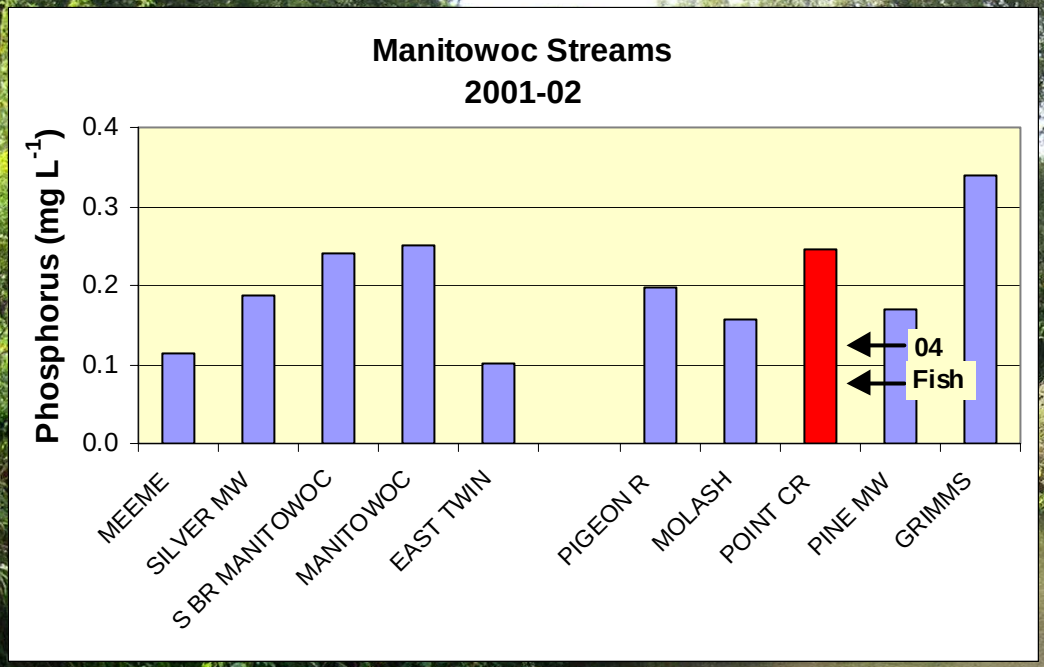
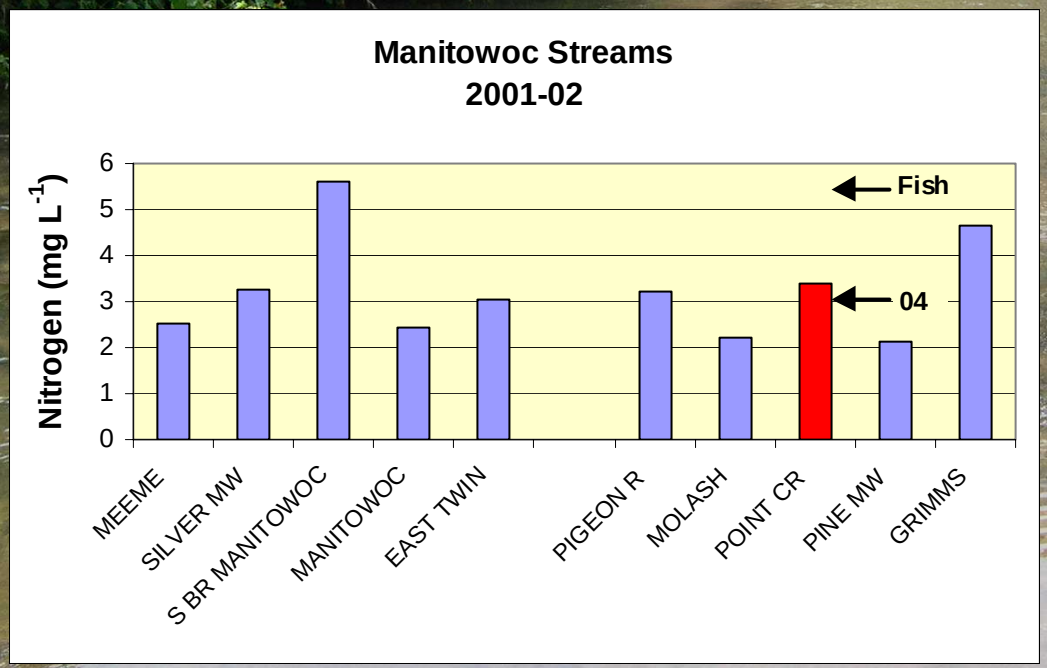
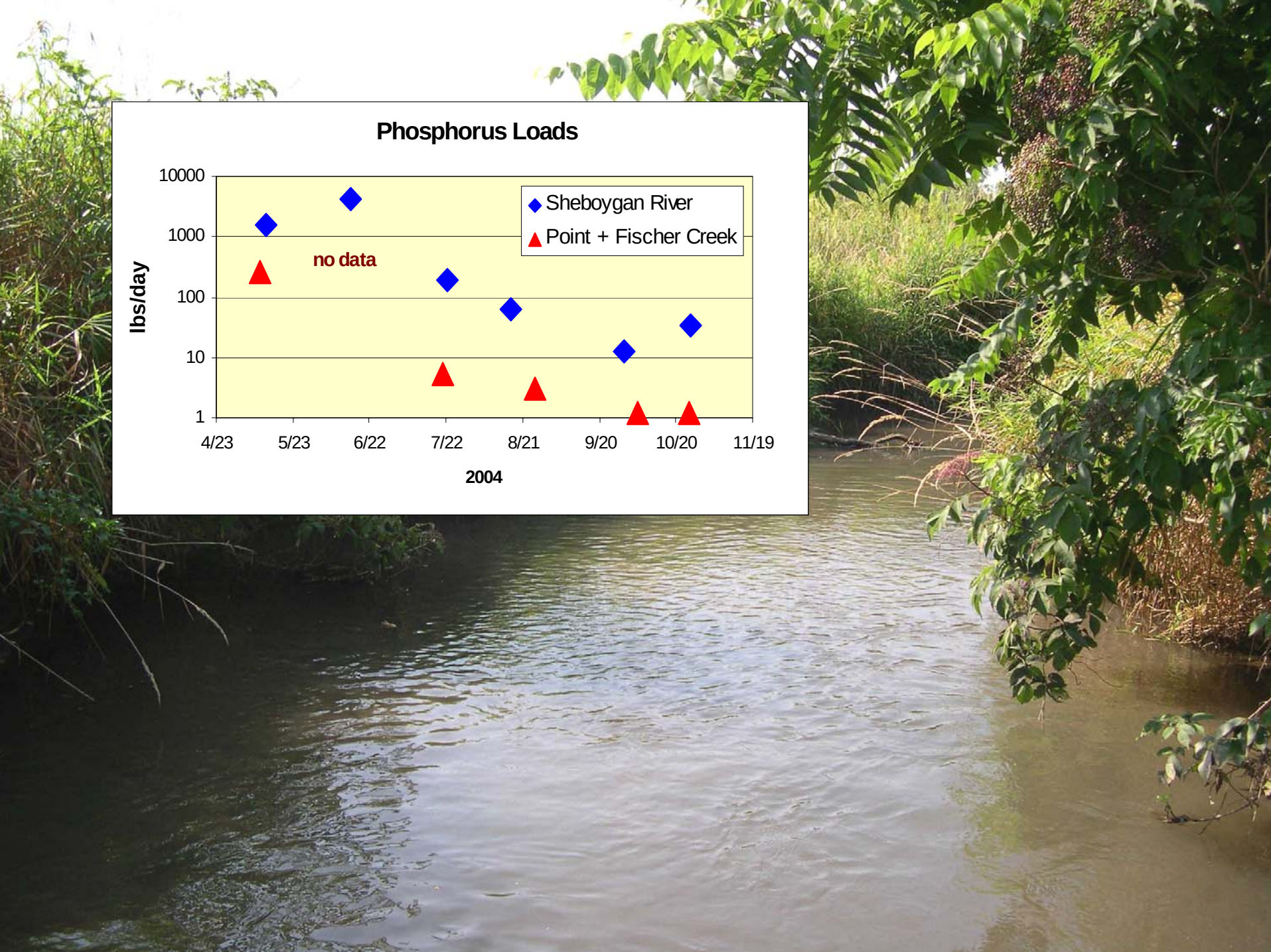

County Locator
Manitowoc County
Fischer and Point Creek
2004 Water Sampling
P8_A CTH C & HWY 42
P8_B CTH C & Nagel Rd
0 0.2 0.4 0.8 1.2 1.6 Miles
N
Legend
Watershed Boundary
Hyrdology
Rainfall Tracking
Sampling Location
P8
P7
P6
P5
P4
P3
P2
P1
P1_B
P1_A
F17
F16
F15
F14
F13
F12
F12_B
F12_A
F11
F10
F9
Town of Liberty
Town of Meeme
Town of Centerville
Union Rd
Range Line
Point Crk Rd
Center Rd
Fischer Creek
Fischer Crk Rd
Centerville Creek
Point Creek
LAKE MICHIGAN
42
43
U
E
X
XX
XX
LS
R


PHOSPHORUS
Point
Fisher
May Runoff
Baseflow
October Runoff
Total Phosphorus (mg L -1)
0
1
2
3
4
5
6
7
8
P1
P3
P4
P6
P8
F9
F10
F11
F12
F14
F15
F17
Sites 2004 with 5 results


NITROGEN
Point
Fisher
May Runoff
Baseflow Mean
October Runoff
Total Nitrogen (mg L -1)
0
5
10
15
20
25
P1
P3
P4
P6
P8
F9
F10
F11
F12
F14
F15
F17
Sites 2004 with 5 results


Manitowoc Streams
2001-02
Phosphorus (mg L-1)
0.4
0.3
0.2
0.1
0.0
04
Fish
MEEME
SILVER MW
S BR MANITOWOC
MANITOWOC
EAST TWIN
PIGEON R
MOLASH
POINT CR
PINE MW
GRIMMS

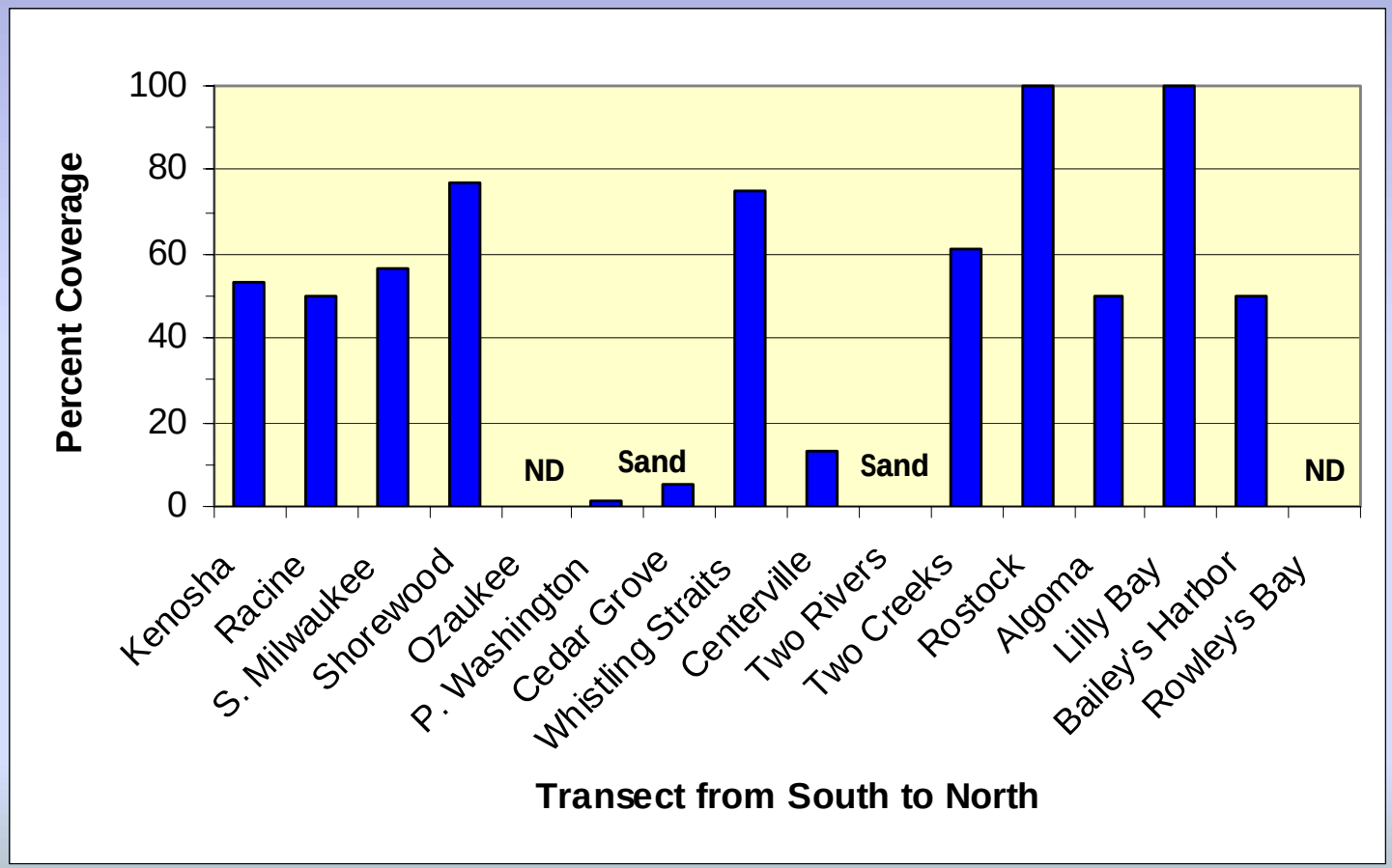

Manitowoc Streams
2001-02
Nitrogen (mg L-1)
6
5
4
3
2
1
0
Fish
04
MEEME
SILVER MW
S BR MANITOWOC
MANITOWOC
EAST TWIN
PIGEON R
MOLASH
POINT CR
PINE MW
GRIMMS


Phosphorus Loads
10000
1000
100
10
1
lbs/day
no data
Sheboygan River
Point + Fischer Creek
4/23
5/23
6/22
7/22
8/21
9/20
10/20
11/19
2004

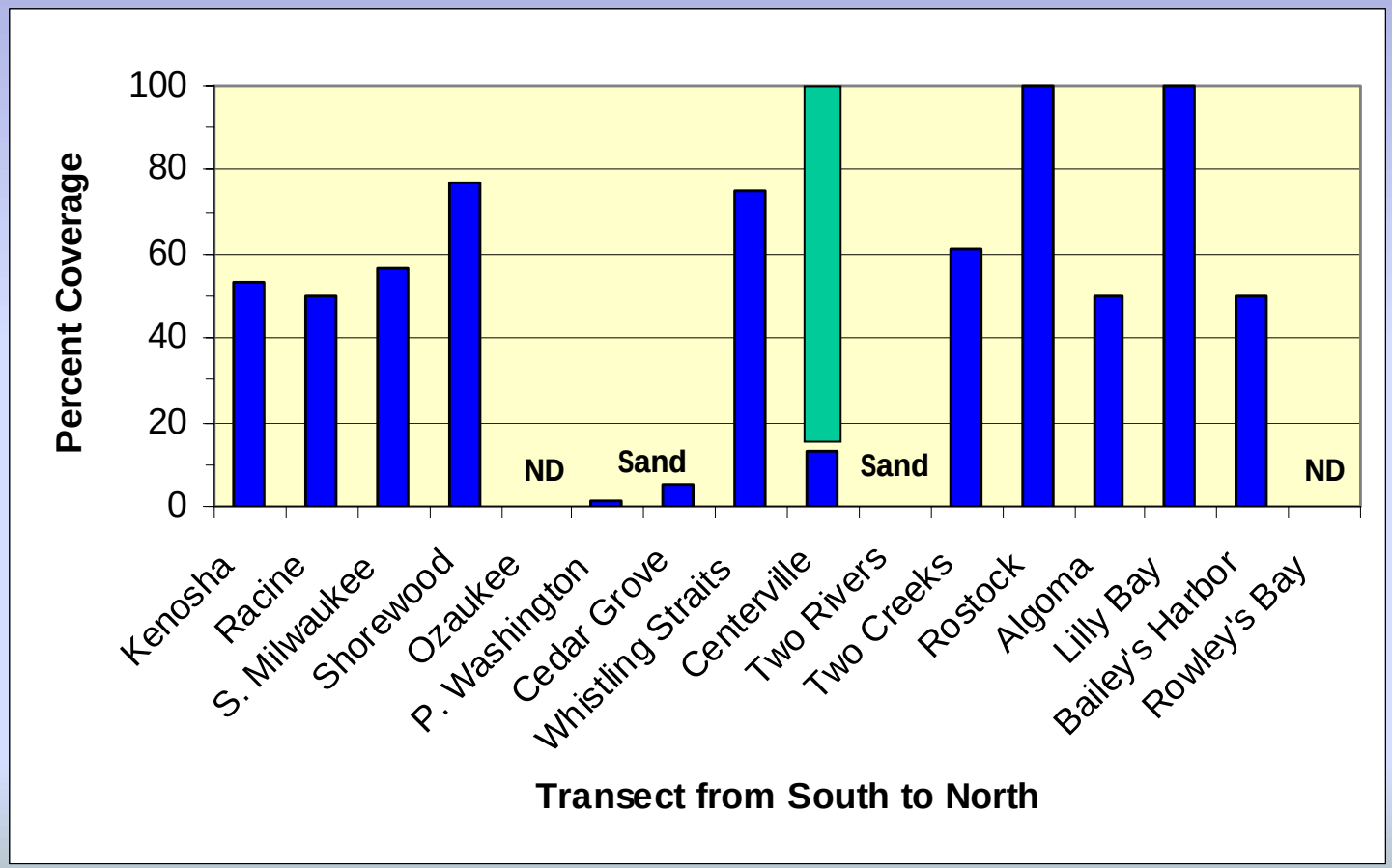
CLADOPHORA **COVERAGE**

- **Coverage dependent upon substrate**
  - *Best is rock*--coverage generally 80-100%
  - *Second best* is a mixture of cobble and sand--coverage generally 50%
  - *Sand* is the least desirable--coverage generally less than 10%

CLADOPHORA COVERAGE IN JUNE



CLADOPHORA COVERAGE IN JUNE



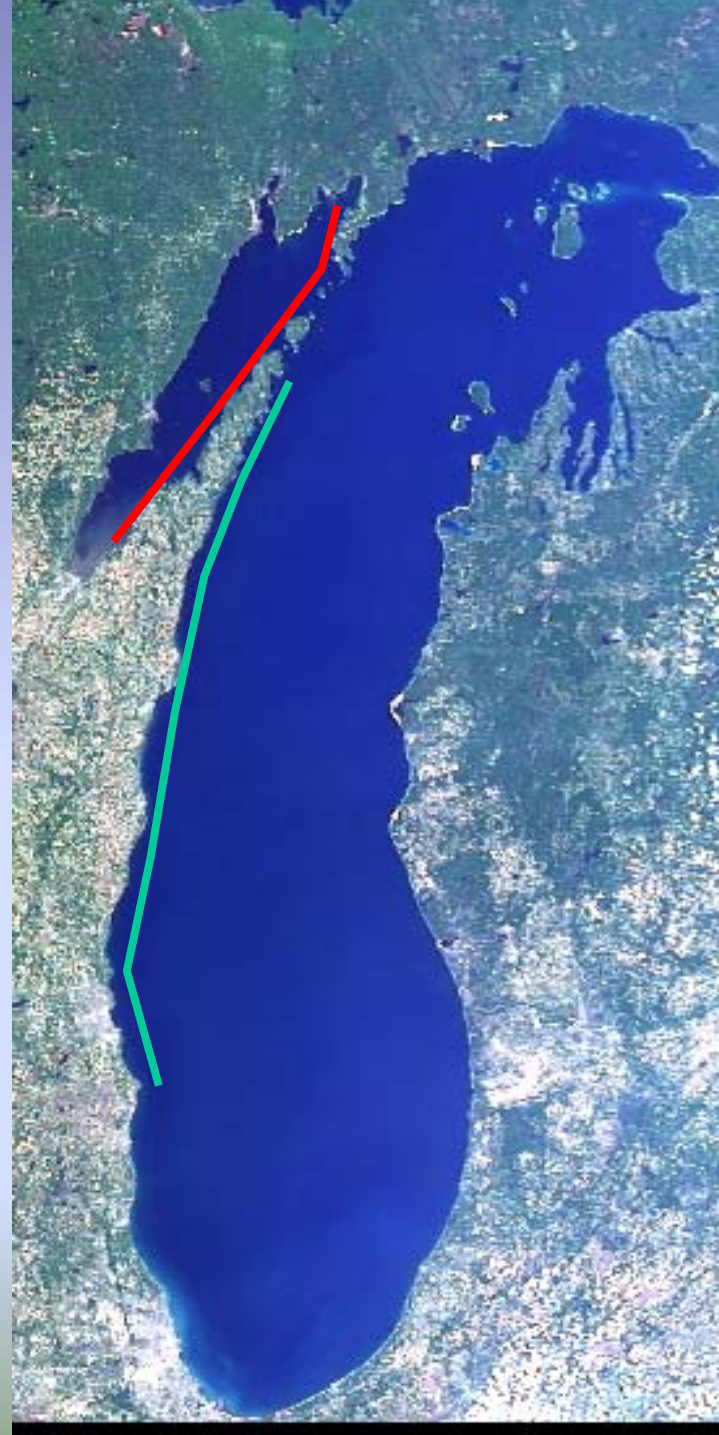
CLADOPHORA DEPOSITION IS NOT NECESSARILY INDICATIVE OF OFFSHORE GROWTH

Beach Monitoring Results

Percentage of Season Affected by Moderate to High Algae Onshore	Number of Beaches	Beach Locations and Names
>60	3	McKinley Beach, Bradford Beach - Milwaukee; Newport Bay Beach - Door
>40 - 60	5	Door (4) and Kewaunee (1)
>20 - 40	13	Ozaukee (1), Milwaukee (1), Manitowoc (1), Kewaunee (1), Door (7), Brown (2)
<=20	45	All Counties

WORK PLAN FOR 2005

- *Shoreline* **Cladophora** *and Nutrient Survey*
  - Reduced number of sites on Wisconsin's Lake Michigan shoreline
  - Add sites in Green Bay, Washington Island to Fayette Pennisula
  - Sample in April and August



WORK PLAN FOR 2005

- *Rivers*
  - Measure P concentrations 12-24 times/year in 15 rivers in Lake Michigan watershed
  - Compute P loads for rivers with gaging stations
- *Streams*
  - Support sampling efforts of WATER Institute and Centerville Cares
- *Beach Monitoring*
  - Estimate amount of *Cladophora* on various beaches
  - Estimate number of gulls

SUMMARY

- Available information suggest that phosphorus concentrations have not increased in recent years in the nearshore waters
- Nutrient levels are generally lowest along the Door County penisula
- *Cladophora* problems on the shoreline occurred along the whole coast
- *Cladophora* growth is not correlated to nearshore phosphorus concentrations
- *Cladophora* deposition on the beach is not indicative offshore growth but instead a factor of currents and other variables
- Zebra and quagga mussels have become established during the last 15 years